REHAU®

RAU-PCAB

Material Data Sheet AV 0041 E

1. Characterisation

RAU-PCAB denotes a range of amorphous thermoplastic blends of polymers, based on polycarbonate and ABS (PC+ABS). These combine resistance to heat distortion, toughness and rigidity in an ideal manner. Depending upon the type and quantity of the starting components, the property profile can be varied within certain limits.

There are four main product lines:

- 100 Series: Standard types
- 400 Series: Glass reinforcement
- 600 Series: Flame proofed
- 800 Series: PC+ASA (special cases)

2. Thermal properties

In resistance to heat distortion, RAU-PCAB practically covers the entire range between ABS and polycarbonate. Standard types come with a Vicat/B50 resistance to heat distortion between 110°C and 129°C; which is achieved by halogen free flame-proofed types up to approx. 110°C. In contrast to pure ABS, there is a clear thermal reserve, due to the higher residual modulus when the Vicat temperature is exceeded (required because of the high glass transition temperature for PC). The ball test in accordance with IEC 335-1 produced values between 75°C and 125°C (higher still for special types). The linear thermal co-efficient of expansion is in the ABS area and showed a low dependency upon the direction of injection (the exception being glass reinforcement).

3. Mechanical properties

Non-reinforced types have elastic modulus values between 2000 and 2700 MPa comparable to ABS. The high impact strength and notched impact strength across a wide temperature range is outstanding. The work capacity (ISO 6603-02: 1989) increases with the proportion of PC. It is worthy of note that the brittle-tough transition of RAU-PCAB is at much lower temperatures than for pure polycarbonate. The stress strain diagrams for non-reinforced types indicate the distinct maxima in the area of the yield point: the tensile strain at break extends well beyond 50%. The mechanical properties alter with the temperature, as well as with the stress duration (creep properties). In order to improve rigidity and strength, RAU-PCAB can be reinforced with glass fibres.

4. Electrical properties

With values for specific surface resistance in excess of 10^{14} Ohm and dielectric strength of > 24kV/mm, the requirements for insulation resistance in the low voltage range up to 1000V have been met. Due to very low absorption of moisture, the electrical properties are not actually dependent upon the environmental moisture content. The tracking resistance according to CTI (test solution A), after combining, is between 150 and 600 V, which is sufficient for a host of applications in the electrical sector.

5. Fire resistance / freedom from halogen

The standard types have normal combustibility and achieve UL94 / HB or FMVSS 302 BR 100m/min.
Flame-proof grades are based predominantly upon chlorine and bromine free flame proofing systems, and are free from halogen, in accordance with VDE 0472/ part 815 or VDE 0472/ part 813. They generally achieve grade UL94 / V0 with a wall thickness of 1.6mm.
Some special flame-proof types meet the requirements of VDE 0604/T1 and /T2 for routing and ancillary trunking in the electrical installation sector, as well as CSTB categories M1 or M2, depending upon wall thickness, in accordance with NF P 92-507. The toxicity, corrosiveness and density of fumes from these halogen-free special types is clearly lower than for PVC or flame-proof polymer compounds containing halogen.

6. Chemical resistance

The resistance of RAU-PCAB to water and neutral aqueous media is favourable at temperatures up to 40°C; beyond this, chemical decomposition takes place (hydrolysis), the speed of which depends upon time and temperature. It is, therefore, not suitable for uses involving prolonged contact with hot water.
At room temperature, there is resistance to mineral acids (even in higher concentrations), to numerous organic acids and aqueous salt solutions. Parts made from RAU-PCAB are not resistant to bases, and can decompose relatively quickly, especially at high temperatures.
Aromatics, ketones, esters and chlorinated hydrocarbons lead to swelling or shrinkage, depending upon the number of functional groups and the length of the aliphatic residues.
Contact with low molecular plasticisers (e.g. from PVC foil) leads to the formation of stress cracking in stressed parts, especially at higher temperatures (solution: polymer plasticisers).
Experience of contact with (aliphatic) paraffin oil has been uncritical, even during longer periods of contact. Fats and oils based on oleic acid esters are to be regarded as critical.

The data in table 2 is based on tests with low stress parts, which were stored at room temperature for 6 months in the agents, without mechanical stress. The list can only be used to provide approximate information; the suitability of RAU-PCAB for a specific part depends on its specific design and application.
Advance tests that are relevant to practice are, therefore, thoroughly recommended.

7. Appearance properties / pigmentability

RAU-PCAB's natural colour tone is opaque, due to its rubber components. Only muted colours, therefore, are available, in a variety of colour tones.
For mouldings with smooth external surfaces, you generally get a high gloss, consistent level of quality with non-reinforced types. A reduction of gloss can be achieved with special types or special tool surface treatment.

8. Weathering behaviour / light resistance

Depending upon the actual climatic conditions and exposure time, outdoor weathering of RAU-PCAB leads to alterations in colour and a reduction in mechanical properties. This reduction in properties, however, is within the range which can be accommodated in the specific release requirements e.g., in the motor or electrical industries. This depends, in each instance, upon the precision of the quality and colour adjustment. (favourable: carbon black stabilisation). For higher requirements there is the 800 series (PC+ASA) and the moulding may even be painted.
The light fastness of RAU-PCAB is determined by the proportion of ABS components and the colour. Halogen free flame-proof types generally achieve at least level 6 (blue scale, tests in accordance with DIN 53387).

9. Processing

RAU-PCAB is mainly fabricated via the injection moulding process, including gas injection techniques. The extrusion process is used for specific applications in the electrical or motor sectors (special profiles). Few material types are suitable for manufacturing hollows via the extrusion blowing process.

10. Machining

RAU-PCAB is easy to saw, drill, turn, file, mill and punch. Carbide-tipped tools are recommended, especially for glass reinforced products. Ensure adequate air or water cooling, so that the temperature at the point of processing does not exceed the softening temperature of the material.

11. Painting

Mouldings, whose surfaces are free from dust and grease, are particularly suited to polyurethane based paint systems. Unsuitable solvent combinations may, however, lead to stress cracking. We recommend that you make inquiries with the paint manufacturer about special systems for (PC+ABS).

12. Printing / Lettering

Printing is possible with the established printing processes. Foil printing may also be applied, using hot stamping techniques. Specially developed colours may be used for laser lettering.

13. Metal coating

Vacuum metalisation is possible with aluminium, tin, copper or other metals in a high vacuum.
ABS rich PCAB types are especially suited to galvanising, as the best bond strength can be achieved with these.

14. Bonding

Mouldings made from RAU-PCAB can be bonded together and with other materials, using suitable adhesives or diffusion adhesives. The prerequisite for this is that the surfaces to be bonded must be thoroughly cleaned from grease and other foreign materials, e.g., with washing petroleum or similar harmless cleaning agents. Twin component adhesives based on epoxy and silicon resin as well as polyurethanes are suitable. Hot-melt adhesives and adhesives based on cyanacrylate can also be used.
Solvent adhesion may be made with 1.3 Dioxolan, an approx. 8% solution of polycarbonate in 1.3 Dioxolan, with MEK or other mixtures of MEK and cyclohexanone (e.g., 50:50).

15. Welding

Mouldings made from RAU-PCAB may be bonded together using ultrasonic, vibration, friction or hot element welding. A proper weld structure must be ensured for joint seams in ultra-sound welding.

Table 1: Guidelines for selected types

			RAU-PCAB						
Properties	**Standard**	**Unit**	**Standard Types**			**GF 20**	**Flame-proof**		**PC+ASA**
			155	**176**	**189**	**491**	**612**	**648**	**877**
Density	ISO 1183	g/cm³	1.10	1.13	1.15	1.25	1.17	1.18	1.15
Moisture absorption	i.A. ISO 62	%	0.2	0.2	0.2	0.2	0.2	0.2	0.28
Water absorption	ISO 62	%	0.7	0.7	0.7	0.6	0.7	0.6	1
Yield stress	ISO 527	MPa	50	50	55	75	60	65	53
Tensile strain at yield	ISO 527	%	4	4.5	5	2	4	4.5	4.9
Tensile stress at break	ISO 527	MPa	40	45	48	75	45	55	n.g.
Tensile strain at break	ISO 527	%	>50	>50	>50	2	>50	>50	>50
Elastic modulus in tension	ISO 527	MPa	2100	2200	2300	6000	2700	2600	2300
IZOD impact strength 23°C	ISO 180/1A	kJ/m²	40	45	48	9	50	45	60
-30°C	ISO 180/1A	kJ/m²	36	41	38	8	18	13	15
Vicat softening temperature B/50	ISO 306	°C	110	118	129	132	88	108	120
HDT/A heat distortion temperature	ISO 75	°C	100	100	110	120	80	91	106
Thermal expansion co-efficient longitud.	ASTM E831	10^{-5}/K	9	8.5	8	3	7.6	8	7-9
laterally	ASTM E831	10^{-5}/K	9.5	9	8.5	8	8	8	n.g.
Specific surface resistance	IEC 93	Ohm	10^{14}	10^{14}	10^{14}	10^{14}	10^{14}	$>10^{15}$	10^{13}
CTI/A tracking resistance	IEC 112	grade	500	300	250	200	300	600	225
Dielectric strength	IEC 243-1	kV/mm	24	24	24	30	30	35	95 (d= 0.6-0.8)
UL fire resistance at 1.6 mm	UL94	class	HB	HB	HB	HB	V0	V0	HB
VDE fire resistance	VDE 0604/T1	---	no	no	no	no	yes	yes	no
VDE freedom from halogen	VDE 0472/ T813 bzw. T815	---	n.t.	n.t.	n.t.	n.t.	yes	yes	n.t.

n.t. = not tested

Table 2:
Chemical resistance of RAU-PCAB at room temperature

1. Hydrocarbons	Result
n-Hexan	0
Premium petrol, containing aromatics	-
Fuel oil	0
Washing petroleum, free from aromatics	0
Benzene	-
Naphthalene	-
Nitro-benzene	-
Toluene	-

2. Alcohols	Result
Ethylalcohol 96%	0
Isopropanol	0
Phenol	-
Glycol	0
Glycerine	0

3. Ketones	Result
Acetone	-
Methyl isobutyl ketone	-

4. Silicon oils	Result
Baysilon M 300	+

5. Acids (max. concentration)	Result
Hydrochloric acid 20%	+
Nitric acid 10%	+
Phosphoric acid 30%	+
Sulphuric acid 30%	+
Citric acid 10%	+
Lactic acid 10%	+
Acetic acid 10%	+
Oleic acid	-

6. Bases	Result
Aniline	-
Caustic soda 10%	-
Ammonia solution, diluted	-

7. Halogens	Result
Bromine	-
Chlorine	-
Iodine	-

8. Oils, fats	Result
Soya oil	-
Olive oil	-
Lard	-
Butter	-

9. Saline solutions	Result
Potash, saturated	-
Sodium thiosulphate	+
Sodium hypochloride	+
Seawater	+

10. Cleaning agents	Result
Washing soap solution, 2%	+
Persil detergent	0
Dor, cleaning agent	+

11. Other media	Result
Diethyl ether	-
Urea	+
Trichloroethylene	-
Nitrobenzene	-
Hydrogen peroxide, 30%	+

+ = resistant
0 = limited resistance
- = not resistant

www.REHAU.com
RAUNET@REHAU.com
■ **AUS:** ☐ Brisbane: 27 Deakin Street, Brendale Queensland 4500, Tel.: 6 17/38 89 75 22 ☐ Melbourne: 9-11 Endeavour Way, Braeside Victoria 3195, Tel.: 3/95 87 55 44 ☐ Sydney: 91 Derby Street, Silverwater New South Wales 2128, Tel.: 2/97 48 17 88 ■ **CDN:** ☐ Moncton: 327 Murray Road, Little Shemogue, New Brunswick E4M 3P3, Tel.: 5 06/5 38 23 46 ☐ Montreal: 625 Lee Avenue, Baie d'Urfé, Quebec, H9X 3S3, Tel.: 5 14/4 57 33 45 ☐ St. John's: 13 Sagona Avenue, Donovan's Industrial Park, Mt. Pearl, Newfoundland, A1N 4P8, Tel.: 7 09/7 47 39 09 ☐ Toronto: 1149 Pioneer Road, Burlington, Ontario, L7M 1K5, Tel.: 9 05/3 35 32 84 ☐ Vancouver: 380 Riverside Road, Unit #2, Abbotsford, British Columbia, V2S 7N8, Tel.: 6 04/8 52 45 27 ☐ Winnipeg: 11 Plymouth Street, Unit 100, Winnipeg, Manitoba, R2X 2V5, Tel.: 2 04/6 97 20 28 ■ **GB:** ☐ Birmingham: Tameside Drive, Holford Way, Witton, Birmingham, B6 7AY, Tel.: 1 21/3 44 23 00 ☐ Glasgow: Phoenix House, Phoenix Crescent, Bellshill, North Lanarkshire, ML4 3NJ, Tel.: 0 16 98/50 37 00 ☐ Manchester: Brinell Drive, Irlam, Manchester, M44 5BL, Tel.: 1 61/77 77-4 00 ☐ Slough: Waterside Drive, Langley, Slough, SL3 6EZ, Tel.: 17 53/58 85-00 ☐ For the automotive sector, please contact the Ross-on-Wye Sales Office: Hill Court, Walford, Ross-on-Wye, Herefordshire HR9 5QN, Tel.: 19 89/76-26 00 ■ **HK:** ☐ Hongkong: 22/F, Silver Tech Tower, 26 Cheung Lee Street, Chai Wan, Tel.: 28 98 70 80 ■ **IRL:** ☐ Dublin: 9 Saint John's Court Business Park, Swords Road, Santry, Dublin 9, Tel.: 1/81 65 02-0 ■ **NZ:** ☐ Auckland: 14 Lorien Place, East Tamaki, Auckland, Tel.: 9/2 72 82 24 ■ **SGP:** ☐ Singapore: 1 King George's Avenue, # 06-00 REHAU Building, Singapore 208557, Tel.: 63 92 60 06 ■ **USA:** ☐ Chicago: 500 East Thorndale Rd., Unit H, Wood Dale, Illinois 60191, Tel.: 6 30/7 87 05 00 ☐ Dallas: 2615 Avenue E, East, Arlington, Suite #124, Texas 76011, Tel.: 8 17/6 40 30 92 ☐ Detroit: 33533 West Twelve Mile Rd., Suite 305, Farmington Hills, Michigan 48331, Tel.: 2 48/8 48 91 00 ☐ Grand Rapids: 5075 Cascade Rd. S.E., Suite A, Grand Rapids, Michigan 49546, Tel.: 6 16/2 85 68 67 ☐ Greensboro: 2606 Phoenix Drive, Suite 810, Greensboro, North Carolina 27406, Tel.:3 36/8 52-20 23 ☐ Los Angeles: 1501 Railroad Street, Corona, California 92880-2501, Tel.: 9 09/5 49 90 17 ☐ Minneapolis: 7710 Brooklyn Blvd. Suite 207, Brooklyn Park, Minnesota 55443, Tel.: 763/5 85 13 80 ☐ New York: 3 North Street, Waldwick, New Jersey 07463, Tel.: 2 01/4 47-11 90 ☐ Seattle: 18900 8th Avenue South # 1000, Seatac, Washington 98148, Tel.: 2 06/4 33 18 83
■ For European exporting companies and if there is no sales office in your country please contact: REHAU AG+Co, Export Sales Office, P.O. Box 30 29, 91018 Erlangen/Germany, Tel.: +49 (0) 91 31 92 50, Export.Sales.Office@REHAU.com

AV 0041 E HSH 10.00